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United States Patent
Brady et al.

(10) **Patent No.: US 9,140,145 B1**
(45) **Date of Patent: Sep. 22, 2015**

PH ADJUSTMENT OF POWER PLANT COOLING WATER WITH FLUE GAS/FLY ASH

Inventors: **Patrick V. Brady**, Albuquerque, NM (US); **James L. Krumhansl**, Albuquerque, NM (US)

Assignee: **Sandia Corporation**, Albu (US)

Notice: Subject to any disclaimer, t patent is extended or adju U.S.C. 154(b) by 71 days.

Appl. No.: **13/207,830**

Filed: **Aug. 11, 2011**

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Cheap anti-scalants for power cooling

United States Patent
Brady et al.

(10) **Patent No.: US 8,812,271 B1**
(45) **Date of Patent: Aug. 19, 2014**

WATERFLOODING INJECTATE DESIGN SYSTEMS AND METHODS

Inventors: **Patrick V. Brady**, Albuquerque, NM (US); **James L. Krumhansl**, Albuquerque, NM (US)

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Notice: Subject to any disclaimer, patent is extended or adj U.S.C. 154(b) by 455 day

Appl. No.: **13/226,276**

Filed: **Sep. 6, 2011**

Angove, M., et al. (1998). "The influence of temperature on the adsorption of cadmium(II) and cobalt(II) on kaolinite." Journal of Colloid and Interface Science 204: 93-103.

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Reduce water use in flooding, fracking for oil

United States Patent
Brady et al.

(10) **Patent No.: US 6,830,695 B1**
(45) **Date of Patent: Dec. 14, 2004**

IN SITU REMEDIATION PROCESS USING DIVALENT METAL CATIONS

Inventors: **Patrick V. Brady**, Albuquerque, NM (US); **Nadim R. Khandaker**, Albuquerque, NM (US); **Jam Krumhansl**, Albuquerque, N **David M. Teter**, Edgewood,

Assignee: **Sandia Corporation**, Albuq (US)

Notice: Subject to any disclaimer, the patent is extended or adjust U.S.C. 154(b) by 82 days.

Appl. No.: **10/356,148**

Filed: **Jan. 31, 2003**

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Cheap contaminant removal from drinking water

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A coordination chemistry model of algal autoflocculation

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ABSTRACT

Autoflocculation is tr ...es, or Ca^{+2} and Mg^{+2}, to anionic alga ... can be quanti-tatively described usi ...lcite interfaces. Cation bridging of a ...$H)_2$ formation. Autoflocculation in r ...$H)_2$ formation, but then plateaus wit ...with increasing pH. Hydroxylapatite ...ost conditions. Calcite surfaces are p ...Ca^{+2} and Mg^{+2} levels are high; calcite has low autoflocculation potential when Ca^{+2} and Mg^{+2} levels are low and sulfate levels are high, and the calcite surface is negatively charged.

Decrease energy of biofuels processing

"In-situ radionuclide treatment uses less energy than surface treatment", State of Wisconsin Energy – Water Roadmap, 2002.

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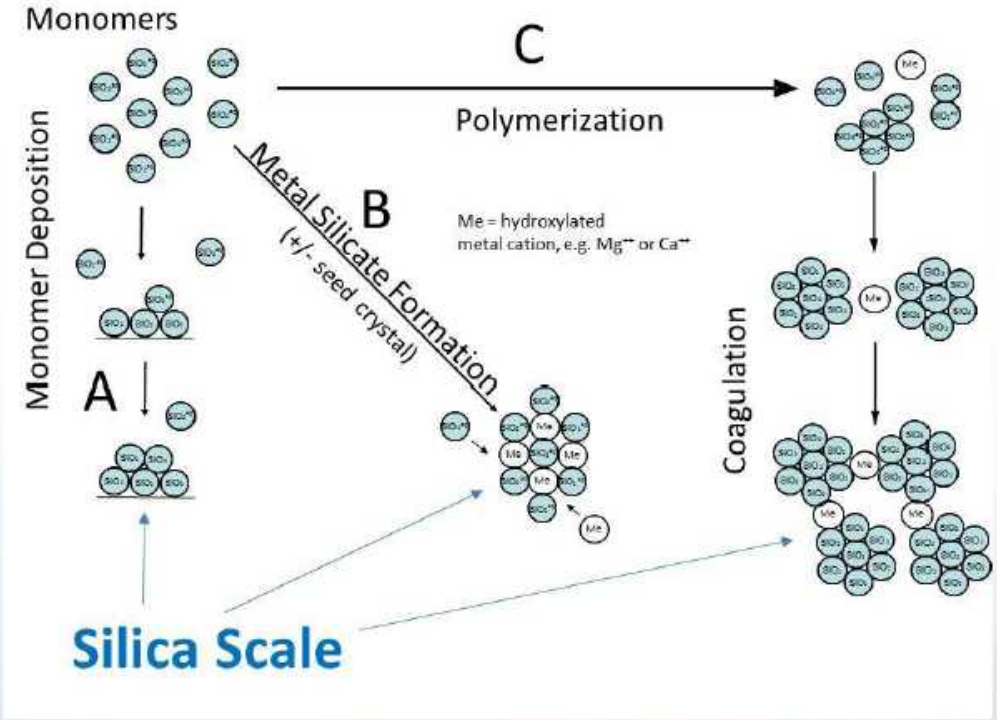
Silica Chemistry in the Energy-Water Nexus

Pat Brady, Tina Nenoff, and James Krumhansl

Dissolved silica often limits water recycling in energy extraction, energy production, and CO_2 capture. New methods are needed to prevent silica scale from forming in cooling towers and boilers.



Recent Projects:

- **Impaired Water Reuse in Power Plant Cooling** (Nenoff LDRD)
- **pH control/scale prevention in Power Plant Cooling** (Brady and Krumhansl, US Patent 9140145)
- **Advanced coagulation for Oil Sands Water Recycling** (Brady et al., WFO)
- **Carbon Mineralization for Climate Change** (Columbia/Sandia ARPA-E).

SiO_2^{aq} concentration in some problem waters:

LANL tap water, 88 ppm; Cooling tower, 123 ppm; El Paso desal conc. 148 ppm; SAGD, 239 ppm; Geothermal (Wairakei, Ohnuma), 520-560 ppm